Thermodynamic modeling of slags and ashes in biomass combustion

Daniel Lindberg

Aalto University, School of Chemical Engineering, Department of Chemical and Metallurgical Engineering

Thermodynamic modeling is an important tool to predict the chemistry of ash-forming elements in biomass and waste combustion for corrosion-, deposition-, and agglomeration related issues. One major limitation is the lack of thermodynamic data of ash compounds and phases formed during combustion or gasification, such as complex K-Na-Ca-Mg-silicates, sulfates, carbonates, and phosphates. An important aspect is also the modeling of the liquid phase properties, both the silicates-rich liquids, and molten salts, as the melting behavior strongly affects both corrosion, deposition and agglomeration. Additional experimental data, such as element release, and fuel characterization, such as speciation of ash-forming elements in the fuel, is also useful input for thermodynamic modeling of the ash behavior in biomass combustion. Examples of recent phase equilibria measurements in the K_2O-CaO-SiO_2 and K_2CO_3-$CaCO_3$ systems, and examples of advanced thermodynamic modeling to study ash-related issues in biomass combustion are also shown.